

SMH
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This application is a division of U.S. Patent Application Number 09/583,45
now USPN 6,417,485.

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for producing laser-induced damage points or areas in transparent objects for use in generating high quality images.

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BACKGROUND OF THE INVENTION

A number of techniques for creating a variety of patterns on the surface and inside of transparent substrates using pulsed laser radiation are well known.

One publication disclosing such techniques is the Russian invention # 321422 to Agadjanov et. al., published on 11/16/1970 (#140454529-33). The invention concerns a method of manufacturing decorative products inside a transparent material by changing the material structure by laser radiation. As disclosed, by moving a material relative to a focused laser beam, it is possible to create a drawing inside the material.

U.S. Patent No. 4,092,518 to Merard discloses a method for decorating transparent plastic articles. This technique is carried out by directing a pulsed laser beam into the body of an article by successively focusing the laser beam in different regions within the body of the article. The pulse energy and duration is selected based upon the desired extent of the resulting decorative pattern. The effect of the laser is a number of three dimensional "macro-destruction" (fissures in the material of the article) appearing as fanned-out cracks. The pattern of the cracks produced in the article is controlled by changing the depth of the laser beam focus along the length of the article. Preferably, the article is in the form of a cylinder, and the cracks are shaped predominantly as saucer-like formations of different size arranged randomly around the focal point of the optical system guiding